Mobile Computing’s Impact on Software Construction

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Motivation

Where is computing headed?

PCs as one-size-fits-all devices are too complicated and too clumsy for many users.

=> trend towards specialized gadgets
  - PDAs: PalmPilot, Psion, Casio, etc.
  - digital books and encyclopedia
  - set-top box + TV= Web access
  - chip cards
  - pen-like text scanners
  - . . .
Applications on mobile gadgets require a redesign

- Size / complexity:
  - Higher volume / more specialization
  - Complex, unreliable applications

- Other UI requirements:
  - Less memory
  - Less processing power

Relevant research directions (I)

Negotiating, adaptive software components
- Domain descriptions
- Consideration of geographic position
- Development and testing
- . . .

Potential scenarios assume:
- Ad-hoc component coupling for accomplishing simple tasks, e.g., printing/displaying documents (→ Jini)
- Analogous to fax machines which negotiate transmission speed and the common protocol for the task fax transmission
Relevant research directions (II)

- component technology/software architecture, in particular for distributed systems & embedded systems
- human-computer interaction aspects

Adaptive software components
Reflection forms the basis of negotiating components

Abstract coupling represents the traditional construction principle in OO to provide plug & work of components:

If any object offers meta-information, a component can be coupled with the most general type, typically called Object:

Coupling semantics have to be defined separately

The simplest way to define coupling semantics is a naming convention:

- exchange values of instance variables with the same name and compatible types
- domain-specific conventions
- programming language
Example: ListX framelet (JavaBean)

Automating the data exchange between any (inner) dialog and any list item:

Finding services in Jini is also based on naming conventions
More advanced concepts better support ad-hoc coupling

- Dynamic adapters
- Coordination frameworks

Dynamic adapters (I)

A standardized domain description, eg, comprising associated services, forms the basis for coupling components which do not know each other.

Dynamic adapters allow a collaboration of components which were developed independently of others.

<table>
<thead>
<tr>
<th>GoF Adapter</th>
<th>Dynamic Adapter</th>
</tr>
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<tbody>
<tr>
<td>static translation</td>
<td>dynamic translation</td>
</tr>
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Selected research projects

MoCCA (Mobile Communication & Computing Applications)

Goals:

- explore application domains of mobile/cellular computing;
- serve as test bed for research in the areas adaptive components and human-computer interaction
Dynamic adapters (II)

- Non-standardized components
- Standardized adapters to non-standardized components
- Automated adaptation
- Optimization strategy
- Coordination component
- Coordination framework
  - Relies on Nokia task terminology
Goals:

- explore application domains of mobile/cellular computing;
- current projects:
  - MoCCA for more interactive conferences (each participant has mobile device; devices are networked)
  - harness the positioning capabilities of cell phones
- serve as test bed for research in the areas of adaptive components and human-computer interaction

Tiled application windows resizeable with your thumb
Goals:

- explore application domains of mobile/cellular computing;
- current projects:
  - MoCCA for more interactive conferences (each participant has mobile device; devices are networked)
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Navigating a two-dimensional infospace
Adaptive Frontend Architecture (I)
Adaptive Frontend Architecture (II)

Voice-controlled Internet banking

Überweisung
Umsätze

Qt

Java-DDE
(ca. 10 KB)

Philips VoCon
(ca. 100 KB)
Voice-controlled Euro conversion in a watch

Applications based on cell phones

Cell phones with GPS-like positioning capabilities.

- immediate identification of traffic jams => warning of those who are on the way there
- measuring the popularity of skiing resorts, eg, on weekends
Conclusions

New mobile devices have a significant impact on application development.

Network-based software architectures are emerging.
The race belongs to the swift